REMARKS

I.   Claim Rejections - 35 USC §112

The Examiner rejected claims 1, 7, and 14 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject mater which applicant regards as the invention.

The Examiner argued that the term "frame update rate" in claims 1, 7, and 14 is a relative term which renders the claim indefinite. The Examiner argued that the term "frame update rate" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The Examiner argued that the desired rate of update is not specified by the use of the term "frame update" and thus the Examiner interpreted it as any rate.

The Applicant respectfully disagrees with this assessment and notes that claims 1, 7 and 14 have been amended to change the term from "wherein said iterative update occurs within a video frame update rate of said blurred video image" to "wherein said iterative update occurs within said blurred video image video frame update rate" in order to clarify the limitation.

The Applicant submits that one of ordinary skill in the art would be apprised of the scope of the invention. All video images are a collection of still images displayed at a frame rate, for example, possibly 60 frames per second. The faster the frame update rate, the smoother the resulting video image. Therefore, in the Applicant's claims the iterative update occurs *within* the video image frame update rate of the video image. The rate is not specified in the claims, and is not required to be specified in order to particularly point out and distinctly claim the subject matter, as the individual frame update rate is not important. What is important is that the iterative update occurs *within* the video frame update rate for the video image which is in the process of being deblurred by the Applicant's invention. If it is

a video image it *will* have a video frame update rate. Therefore, only a video image includes a video frame update rate, as an update rate for a still image would not make sense; a still image is only a single image and does not update at any rate.

The Applicant's invention is a method and system for deblurring video images, wherein the video image is deblurred by the Applicant's invention one still image of the video image at a time wherein the image is deblurred such that the iterative update occurs within the video frame update rate. In other words, the image is deblurred at least as fast as (i.e. within) the frame update rate or otherwise a deblurred video image would never be displayed as the next frame would display before the previous frame was processed and deblurred.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §112, second paragraph, rejections of claims 1, 7 and 14 be withdrawn.

II.   Claim Rejections - 35 USC § 103

Requirements for Prima Facie Obviousness

The obligation of the examiner to go forward and produce reasoning and evidence in support of obviousness is clearly defined at M.P.E.P. §2142:

> "The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness."

The U.S. Supreme Court ruling of April 30, 2007 (*KSR Int'l v. Teleflex Inc.*) states:

> "The TSM test captures a helpful insight: A patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. Although common sense directs caution as to a patent application claiming as innovation the combination of two known devices according to their established functions, it can be important to identify a reason

that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does."

"To facilitate review, this analysis should be made explicit."

The U.S. Supreme Court ruling states that it is important to identify a *reason* that would have prompted a person to combine the elements and to make that analysis *explicit*. MPEP §2143 sets out the further basic criteria to establish a *prima facie* case of obviousness:

1. a reasonable expectation of success; and

2. the teaching or suggestion of all the claim limitations by the prior art reference (or references when combined).

It follows that in the absence of such a *prima facie* showing of obviousness by the Examiner (assuming there are no objections or other grounds for rejection) and of a *prima facie* showing by the Examiner of a *reason* to combine the references, an applicant is entitled to grant of a patent. Thus, in order to support an obviousness rejection, the Examiner is obliged to produce evidence compelling a conclusion that the basic criterion has been met.

Biemond et al. in view of Owens et al. and Lavenier

The Examiner rejected claims 1-2, 5-8, 12-15, and 19-20 under 35 U.S.C. § 103(a) as being unpatentable over Biemond in view of Owens (citing "Computer Vision on the MGAP"), and in further view of Lavenier (citing "Advanced Systolic Design").

Regarding claim 1, the Examiner argued that Biemond describes an iterative method for image deblurring performed by a computing system used to process the image, but admitted does not explicitly teach the downloading of a video image, the use of a systolic array processor to perform the deblurring method. The Examiner argued that Owens teaches the downloading of an image for further processing (citing paragraph 2 of the "Introduction" section). The Examiner argued that Owens

further teaches the use of a systolic array of interconnected logic blocks (Digital Processors) for the parallel processing of images (stating deblurring is image processing)(citing sections 2.1 and 3.1). The Examiner argued that Owens shows the adjacent interconnections of the processing array in which the plurality of pixels are communicated to their respective Digital Processors (processing logic blocks) (citing FIG. 4). The Examiner argued that it would have been obvious to one of ordinary skill in the art at the time of the invention to use the known systolic array disclosed by Owens with the known iterative image deblurring method disclosed by Biemond according to Lavenier that teaches the use of iterative methods on systolic array (citing Lavenier, section 5.2). The Examiner argued therefore that the combination provides the predictable result of iterative image deblurring according to the known method of Biemond using the known device of a systolic array as disclosed by Owens and Lavenier.

The Examiner admitted that neither Owens, nor Lavenier, nor Biemond discuss the processing of video images. However, the Examiner argued that a video is a series of frames (images) and a method such as is taught by Biemond that operates on a single image can clearly be used to operate on a plurality of images sequentially. Thus, the Examiner argued that the method taught by Biemond is view of Owens and Lavenier for deblurring an image can also be used on a sequence of images (video).

The Examiner argued that Biemond teaches the iterative deblurring method in the section entitled "Iterative Solutions" (citing Biemond, page 865) using three sets of data each dependent on the particular pixel data they correspond to (the Examiner argued that thus each set is an image "plane" because it varies with x and y, where x and y are the pixel indices). Furthermore, the Examiner argued that the video frame update rate is not defined within the language of the claim as indicated by the 35 U.S.C. § 112 second paragraph rejections given above and thus, is interpreted by the Examiner as being any reasonable rate. The Examiner argued that the method and system disclosed by Biemond in view of Owens and

Lavenier has some rate at which it accomplishes the image deblurring and thus meets the limitations of this claim language.

The Examiner admitted that Owens and Biemond do not explicitly teach the uploading of the blurred image. The Examiner takes official notice that the uploading of the deblurred (processed) image is notoriously well known in the art. The Examiner argued that since the purpose of deblurring the image is to produce a deblurred image for display or further processing, and thus would have been obvious to one of ordinary skill in the art to store or upload the processed image for retrieval or display.

The Applicant respectfully disagrees with this assessment and notes that the additional limitations added to claim 1 with this amendment as submitted above are not disclosed in the prior art as admitted by the Examiner. The Applicant's invention is a method and system for deblurring video images, wherein the video image is deblurred by the Applicant's invention one still image of the video image at a time wherein the image is deblurred such that the iterative update occurs within the video frame update rate. The cited prior art does not disclose this limitation.

The Examiner has admitted that the prior art does <u>not</u> disclose deblurring of a *video* image; one of the limitations of the Applicant's invention. The Examiner argues that video images are a series of frames and a method such as taught by Biemond which operates on a *single* image would operate on a *plurality* of images. The Examiner has not provided evidence of such a conclusion. The Applicant reminds the Examiner that conclusory statements by the Examiner do <u>not</u> make a *prima facie* case of obviousness. The Examiner has not stated or argued how the disclosure in Biemond in view of Owens and Lavenier of a single frame is a video image.

The Applicant submits that the prior art references of Biemond and Owens only disclose methods on *single* images as high resolution images require significant computing power and require a significant amount of time to process. This makes it virtually impossible (utilizing the cited prior art methods) to deblur streaming video

in *real time*; i.e. within the video frame update rate. Nothing disclosed in the Biemond, Owens or Lavenier references suggests that these methods, singularly or in combination, could be processed at a rate within the video frame update rate, or that these methods could even be utilized in deblurring video images. The Examiner has argued that Biemond in view of Owens and Lavenier has some rate at which it accomplishes deblurring of the image and therefore meets the claim limitation; however, if that rate of Biemond in view of Owens and Lavenier does not occur within a video frame update rate, a video image would never be displayed. As the prior art references do not disclose deblurring *video* images, they obviously cannot disclose that the iterative update occurs within the blurred image video frame update rate and therefore do not disclose the claim limitation.

The Applicant submits that the Applicant's invention of claim 1 is <u>not</u> a predictable use or prior art elements according to their established functions. As the cited prior art discloses methods utilized on *single* images only, without <u>any</u> teaching or suggestion that the iterative update could be utilized to deblur *video* images or wherein the iterative update occurs *within* the blurred video image video frame update rate, the Applicant submits that the prior art combination does not provide a predictable result of the Applicant's invention.

The Applicant reminds the Examiner that it remains *legally insufficient* to conclude that a claim is obvious even if each element of the claim can be independently shown in the cited prior art (*KSR v. Teleflex*). The Examiner has not provided any motivation or reason for the combination, merely stating the conclusory opinion that it would be obvious. The U.S. Supreme Court has stated that some articulated reasoning with some rationale underpinning to support the legal conclusion of obviousness must be provided (*KSR v. Teleflex*, page 14), including identifying a reason that would have prompted a person of ordinary skill in the art to combine the elements as the claimed invention does. This rationale must be made *explicit* including a detailed explanation of the *background knowledge* possessed by a person having ordinary skill in the art at the time of the

invention. Anything less than such an explicit analysis may <u>not</u> be sufficient to support a *prima facie* case of obviousness (*KSR v. Teleflex*, page 14). The Examiner has not provided this explicit reasoning why one of ordinary skill in the art would combine the elements of the combination as the Applicant's invention does for <u>any</u> of the 20 claims in the application. Therefore, the Applicant submits that this same argument against a *prima facie* case of obviousness for lack of an explicit reasoning why one of ordinary skill in the art would combine the elements can be made for <u>each</u> claim in the application. Without this required reasoning, the Examiner has not made a *prima facie* case of obviousness and the Applicant is entitled to a grant of a patent in accordance with MPEP §2143 and the U.S. Supreme Court, *KSR v. Teleflex*.

 The Examiner has not stated that the prior art discloses the limitation of each processing block exchanges data *<u>only</u>* with *<u>adjacent</u>* processing blocks, merely stating that the limitation is the definition of array processing. The Applicant respectfully disagrees with this assessment noting that the Applicant's limitation is that the processing array exchanges data *only* with the adjacent processing block. This is <u>not</u> the definition of array processing and this limitation of only exchanging data with adjacent processing blocks is not disclosed in the cited prior art references. The Examiner has not addressed this limitation whatsoever in the office action and therefore, the Applicant is entitled to a grant of a patent.

 Therefore, Biemond in view of Owens and Lavenier does not disclose the limitations of: 1) deblurring a *video* image, 2) uploading and downloading a *video* image, 3) providing an iterative update of the blurred *video* image within the blurred video image video frame update rate, and 4) wherein each processing block exchanges data *<u>only</u>* with adjacent processing blocks.

 Therefore, Biemond in view of Owens and Lavenier fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claim 1 is <u>not</u> disclosed. Additionally, the Examiner has not provided any explicit reason to combine the Biemond, Owens and Lavenier.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claim 1 based on the Biemond, Owens and Lavenier references be withdrawn.

Regarding claim 2, the Examiner argued that Owens and Lavenier disclose the implementation of an iterative method on a systolic array as is discussed in rejection of claim 1. The Examiner argued that Biemond teaches an iterative method for deblurring images (citing Biemond, pages 865-868 under the section titled "C. Iterative Solutions") using error feedback and past deblurred image estimate feedback (citing equations 56 and 57 on page 865). Furthermore, the Examiner argued that as evidenced by Lavenier (citing Lavenier section 5.2), the implementation of iterative algorithms on a processing array was well known to one of ordinary skill in the art.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of dependent claim 2. Furthermore, the Examiner did not state or argue in the office action that the limitations of claim 2 are disclosed in the prior art. Specifically, the limitations wherein said three planes comprises 1) said blurred video image, 2) a blurred video image prediction error and 3) a past deblurred video image are <u>not</u> disclosed in the prior art references and the Examiner has <u>not</u> stated that the prior art discloses these limitations. MPEP §2143 states that in order for the Examiner to establish a *prima facie* case of obviousness, the Examiner must show the teaching of <u>all</u> claim limitations by the prior art references singularly or in combination.

Therefore, Biemond in view of Owens and Lavenier fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claim 2 is not disclosed. Additionally, the Examiner has not provided any motivation to combine the Biemond, Owens and Lavenier references nor has the Examiner made an explicit reasoning why one of ordinary skill in the art would combine the references.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejection of claim 2 based on the Biemond, Owens and Lavenier references be withdrawn.

Regarding claim 5, the Examiner argued that Biemond in view of Owens and Lavenier, as applied to claim 1, teach the deblurring of an image using a systolic processor array. The Examiner argued that Owens teaches the implementation of image processing methods using systolic array processors for image processing (citing Owens, final line of the second paragraph on page 338) that at a least one pixel is operated on per processor. Thus, the Examiner argued that, as is taught by Owens, the pixels are grouped into groups of pixels such that at least one pixel is operated on per processor.

Regarding claim 6, the Examiner argued that filtering and image processing methods such as deblurring are done locally by operating on groups of adjacent pixels. The Examiner argued that Owens discloses an example of such a grouping (citing Owens section 3.1 on page 338) wherein Owens disclosed the use of 3x3 masks applied to the image and hence it was known to group and process pixels in a processing array.

The Examiner argued that claims 7-8, 12-13, 14-15, and 19-20 claim the corresponding device that performs the method of claims 1-2, and 5-6. The Examiner argued that as per the rejections of claims 1-2 and 5-6, the method has been disclosed by Biemond in view of Owens and Lavenier. Furthermore, the Examiner argued that the device has been disclosed since Owens and Lavenier have disclosed the implementation of such methods on a systolic array device.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of claims 5-8, 12-15 and 19-20. The limitation wherein the iterative update occurs within the video frame update rate has been added through amendment to independent claims 7 and 14 in addition to claim 1.

Therefore, Biemond in view of Owens and Lavenier fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claims 5-8, 12-15 and 19-20 is not disclosed. Additionally, the Examiner has not provided any motivation to combine the Biemond, Owens and Lavenier references nor has the Examiner made an explicit reasoning why one of ordinary skill in the art would combine the references.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claims 5-8, 12-15 and 19-20 based on the Biemond, Owens and Lavenier references be withdrawn.

Biemond in view of Owens, Lavenier and Gorinevsky

The Examiner rejected claims 3, 9-10, and 16-17 under 35 U.S.C. § 103(a) as being unpatentable over Biemond in view of Owens and Lavenier as applied to claims 1-2 and 5 above, and in further view of Gorinevsky (citing "Optimization-based Tuning of Low-bandwidth Control in Spatially Distributed Systems").

Regarding claim 3, the Examiner argued that Biemond identifies the existence of regularization error and discloses a solution of the regularization error (citing Biemond section 5, page 868). The Examiner argued that the term S*u(n) as defined by applicant was known to one of ordinary skill in the art as a solution to the regularization problem. The Examiner admitted that Biemond does not teach the regularization method shown by applicant. However, the Examiner argued that Gorinevsky (citing Gorinevsky sections 1 and 3) teaches a filter that improves the spatial response (reduces regularization error) of the system. The Examiner argued that it would have been obvious to one of ordinary skill in the art to substitute the regularization method as taught by Gorinevsky for the regularization method taught by Biemond with a reasonable expectation of success while maintaining or improving the spatial response (reduction of regularization error) provided by the method taught by Biemond. Furthermore, the Examiner argued that in the same sections of Gorinevsky, the use of the term K has also been disclosed.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of dependent claim 3. Additionally, Biemond in view of Owens, Lavenier and Gorinevsky does not disclose the limitations of claim 3.

The Examiner has admitted that Biemond does <u>not</u> utilize or disclose the algorithm in the method of claim 3, however, the Examiner argues that the term S*u(n) is known as a solution to the regularization problem and Gorinevsky teaches a filter that improves the spatial response of the system. The Examiner continues, stating that Gorinevsky teaches the term K. The Examiner does <u>not</u> state that this is the same algorithm as in claim 3, however. Specifically, the algorithm: $u(n + 1) = u(n) - K *(H *u(n) - y_b) - S * u(n)$ is <u>not</u> disclosed in the prior art and the Examiner has not stated or argued that it *is* disclosed. Individual components of the may be disclosed, but the algorithm itself is not disclosed. Without the algorithm disclosed in the prior art, either singularly or in combination, a *prima facie* case of obviousness has not been made.

Therefore, Biemond in view of Owens, Lavenier and Gorinevsky fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claim 3 is not disclosed. Additionally, the Examiner has not provided any motivation to combine the Biemond, Owens, Lavenier and Gorinevsky references nor has the Examiner made an *explicit* reasoning why one of ordinary skill in the art would combine the references.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claim 3 based on the Biemond, Owens, Lavenier and Gorinevsky references be withdrawn.

The Examiner argued that claims 9 and 16 claim the corresponding device that performs the method of claim 3. The Examiner argued that as per the rejections of claims 1-3, the method has been disclosed by Biemond in view of Owens, Lavenier, and Gorinevsky. Furthermore, the Examiner argued that the

device has been disclosed since Owens and Lavenier have disclosed the implementation of such methods on a systolic array device.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of claims 9 and 16. The limitation wherein the iterative update occurs within the video frame update rate has been added through amendment to independent claims 7 and 14 in addition to claim 1.

Therefore, Biemond in view of Owens, Lavenier and Gorinevsky fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claims 9 and 16 is not disclosed. Additionally, the Examiner has not provided any motivation to combine the Biemond, Owens, Lavenier and Gorinevsky references nor has the Examiner made an explicit reasoning why one of ordinary skill in the art would combine the references.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claims 9 and 16 based on the Biemond, Owens, Lavenier and Gorinevsky references be withdrawn.

Regarding claims 10 and 17, the Examiner admitted that Owens and Lavenier do not explicitly teach the preloading of the information into each processing logic block of the array. However, the Examiner argued that as is evidenced by Owens (citing Owens second paragraph of page 338) the addition, subtraction, multiplication,…,etc. are performed on the received pixel data. The Examiner argued that in order to perform these operations the values intended to be used in these operations must be stored in the processing elements. Furthermore, the Examiner argued that as per the disclosure of Lavenier (citing Lavenier section 5.2) the weights of matrix W are stored in the processing units so that they can be used to multiply the values of the input (X). Thus, the Examiner argued that it is clear from this disclosure that known constants are stored in the processing units (logic blocks) in order to perform the predetermined operations.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of claims 10 and 17. The limitation wherein the iterative update occurs within the video frame update rate has been added through amendment to independent claims 7 and 14 in addition to claim 1.

The Examiner has admitted that the prior art references do not disclose the claim 10 and 17 limitations merely stating that other values are stored in the processing blocks. The Examiner does not try to explain how it would be obvious to one of ordinary skill in the art to preload the operators H, K and S into each processing logic block of the array.

Therefore, Biemond in view of Owens, Lavenier and Gorinevsky fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claims 10 and 17 is not disclosed.

Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claims 10 and 17 based on the Biemond, Owens, Lavenier and Gorinevsky references be withdrawn.

Biemond in view of Owens, Lavenier, Gorinevsky and Dowski

The Examiner rejected claims 4, 11, and 18 under 35 U.S.C. §103(a) as being unpatentable over Biemond in view of Owens, Lavenier, and Gorinevsky as applied to claims 3, 9-10, and 16-17 in further view of Dowski (U.S. Patent Publication No. 2003/0169944).

Regarding claim 4, the Examiner argued that claim 4 is a modification of the method of claim 3 wherein the deblurring is performed on each color space separately. The Examiner argued that Biemond discusses image processing, but admitted does not go into the particulars of color space processing. However, the Examiner argued that as evidenced by Dowski (citing Dowski paragraph [0018]) the method of dividing an image into its color spaces and then deblurring each of the color spaces was known to one of ordinary skill in the art. Furthermore, the

Examiner argued that the teaching of Dowski shows that one of ordinary skill in the art knew how to apply image-filtering processes such as deblurring to each color channel. The Examiner argued that given that Biemond teaches the deblurring of at least a grayscale image and that Dowski teaches the application of a single channel deblurring process to each of the color channels. The Examiner argued that it would have been obvious to one of ordinary sill in the art to combine the teachings of Dowski with Biemond to perform the deblurring technique as taught by Biemond on each channel of a color image (citing as taught by Dowski) and yield the expected result of a deblurred color image.

The Examiner argued that claims 11 and 18 claim the corresponding device that performs the method of claim 4. The Examiner argued that as per the rejections of claims 1-4, the method has been disclosed by Biemond in view of Owens, Lavenier, Gorinevsky, and Dowski. Furthermore, the Examiner argued that the device has been disclosed since Owens and Lavenier have disclosed the implementation of such methods on a systolic array device.

The Applicant respectfully disagrees with this assessment and notes that the argument presented above against the rejection of claim 1 applies equally against the rejection of claims 4, 11 and 18. The limitation wherein the iterative update occurs within the video frame update rate has been added through amendment to independent claims 7 and 14 in addition to claim 1.

The Examiner has made a conclusory statement that since Dowski teaches deblurring a *single* color channel, it would be obvious to perform the deblurring on *each* color channel. The Examiner has stated that the Dowski reference is an example of what would be obvious to one of ordinary skill in the art. The Applicant submits the same reference as evidence as to what would be obvious to one of ordinary skill in the art. Therefore, as Dowski teaches only deblurring a *single* color channel, the Applicant submits that without further evidence it would <u>not</u> be obvious to one of ordinary skill in the art to apply the method of claim 4 to *each* color channel.

Therefore, Biemond in view of Owens, Lavenier, Gorinevsky and Dowski fails in the aforementioned *prima facie* obviousness test as each and every limitation of the Applicant's claims 4, 11 and 18 is not disclosed.
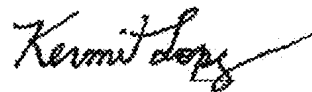
Based on the foregoing, the Applicant respectfully requests that the 35 U.S.C. §103(a) rejections of claims 4, 11 and 18 based on the Biemond, Owens, Lavenier, Gorinevsky and Dowski references be withdrawn.

III. Conclusion

In view of the foregoing discussion, the Applicant has responded to each and every rejection of the Official Action. The Applicant has clarified the structural distinctions of the present invention. Applicant respectfully requests the withdrawal of the rejections under 35 U.S.C. §112 and §103 based on the preceding remarks. Reconsideration and allowance of Applicant's application is also respectfully solicited.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact the undersigned representative to conduct an interview in an effort to expedite prosecution in connection with the present application.

Respectfully submitted,

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